Ferroelectricity Newsletter

A quarterly update on what's happening in the field of ferroelectricity

Volume 9, Number 2 Spring 2001

CATCHING UP ON SOME SPECIAL MEETINGS

Rather than highlighting one big international meeting that takes up the major part of the available space, this issue of the ***Ferroelectricity Newsletter*** brings you information on four symposia, seminars, and workshops that were smaller as far as the number of presentations was concerned.

The first is the **Second International Seminar on Relaxor Ferroelectrics (ISRF-II)**, held in Dubna, Russia, on 23-28 June 1998. As the guest editor of the proceedings, L.A. Shuvalov, said in the editorial, the investigation of relaxor ferroelectrics played a key role in the study of partly disordered media during the last decade of the 20th century. The list of papers is on pages 2-3.

The **Eighth International Symposium on Ferroelectric Semiconductors (ISFS-8)** was held on 30 August - 5 September 1998 in Rostov-on-Don, Russia. The history of the symposia on ferroelectric semiconductors began with the discovery of the remarkable properties of SbSI in 1958. In their editorial, guest editors A.A. Grekov and S.O. Kramarov give an overview of the historical facts and unsolved principal questions of high temperature superconductivity. You will find the list of the ISFS-8 presentations on pages 4-6.

Ferroelectric and Related Models in Biological Systems, a special issue of ***Ferroelectrics,*** explores whether certain macromolecular structures of biology can be described as ferroelectric, and whether such a description might help us understand some of the functional processes of living organisms. On pages 7-8 you will find the list of a collection of papers from the **Second Workshop on Nonlinear Models of Biomembrane Molecular Structures** and the **Workshop on Condensed-State Models of Voltage-Dependent Ion Channels.**

One of the upcomming meetings described in this issue is the **Second Ferroelectrics Workshop in Puerto Rico** to be held this June. In May1999, 28 oral and 19 poster presentations were given at the first **Ferroelectrics Workshop in Puerto Rico**. We bring you the list of this workshop's papers on pages 9-10.

In the upcoming issue we will go back to our usual format of bringing you information on one major meeting of the worldwide ferroelectrics community.

Rudolf Panholzer
Editor-in-Chief

IN THIS ISSUE

Ferroelectricity Newsletter

Volume 9, Number 2
Spring 2001

The *Ferroelectricity Newsletter* is published quarterly by the Naval Postgraduate School, Space Systems Academic Group, Monterey, California, with the support of the Office of Naval Research (ONR).

Prof. Rudolf Panholzer
Editor-in-Chief
e-mail: rpanholzer@nps.navy.mil

Dr. Hannah Liebmann
Managing Editor
500 Glenwood Circle, Suite 238
Monterey, CA 93940-4724, USA
phone: +831-649-5899
fax: +831-655-3734
e-mail: liebmann@redshift.com

ISRF-II PAPERS

SECOND INTERNATIONAL SEMINAR ON RELAXOR FERROELECTRICS (ISRF-II)

On 23 – 28 June 1998 the Second International Seminar on Relaxor Ferroelectrics, hosted by the I.M. Frank Laboratory of Neutron Physics, was held in Dubna, Russia. The proceedings of this meeting were published in **Ferroelectrics**, *Volume 235, Numbers 1-4 (1999).*

In the last decades of the 20th century, investigations of partly disordered systems have taken a leading role in modern solid state physics, ***Lev A. Shuvalov****, chairman of the organizing committee, wrote in his guest editorial that the investigated compounds do not manifest at one and the same time the strongly smeared phase transition, the substantial frequency dispersion of the dielectric permittivity, the presence of random local electric and elastic fields, non-ergodicity, and transition into the ferroelectric state only under the influence of the electric field at a particular value and orientation.*

Dr. Shuvalov went on to say: "Up to now, different interpretation exist for the low-temerature phase of the classical RF-PMN. According to some of the considerations, this phase is in the non-ergodic metastable glass-like state with a long relaxation time, while in the other assumptions it is treated as consisting of stable nano-domains. Generally speaking, the problem of the phase E-T diagram for PMN abd other RF in the low-temperature region is not finally solved and understood yet. Therefore, it probably would be expedient to carry out the scanning precision investigation of local minostructure of PMN and other model RF at low temperatures by determining the spatial symmetry (if it will be possible), and afterwards the analogous study of the electric fields applied in various ways."

Shuvalov concludes his editorial with the following thought: "Unfortunately, the increase in the high quality experimental material still did not lead to the creation of a reliable model theory of RF. Perhaps, it would be nice to attract prominent theoreticians to this problem. The amount of the experimental material for theoreticians is already almost sufficient."

The list of the titles and authors of the ISRF-II presentations follows.

^{93}Nb NMR in PMN and the random bond-random field spherical model for relaxor ferroelectrics
R. Blinc, B. Zalar, A. Gregorovic, and R. Pirc

Raman scattering from relaxor ferroelectrics and related compounds
R. Farhi, M. El Marssi, J.-L. Dellis, Yu.I. Yuzyuk, J. Ravez, and M.D. Glinchuk

Ammonium resonance modes and orientational glass state in the $K_{1-x}(NH_4)_xI$ mixed crystals
L.S. Smirnov, L.A. Shuvalov, and I. Natkaniec

Phase transitions and precursor phenomena in doped quantum paraelectrics
W. Kleemann, J. Dec, D. Kahabka, P. Lehnen, and Y.G. Wang

Phase trransition from ferroelectric to glass-like microstructure in thin films
V.A. Alyoshin, E.V. Sviridov, L.A. Sapozhnikov, and I.N. Zakharchenko

Dielectric permittivity and Fe- and Cu-doping effect in $KTaO_3$ and $K_{1-x}Li_xTaO_3$
V. Trepakov, V.Vikhnin, M. Savinov, P. Syrnikov, S. Kapphan, V. Lemanov, H. Hesse, and L. Jastrabik

Dielectric relaxation in $PbZrO_3$-$K_{0.5}Bi_{0.5}TiO_3$ with diffused phase transition
S.A. Gridnev, S.V. Popov, and H. Beige

Disorder and anharmonicity in simple and complex perovskites
C. Malibert, B. Dkhil, M. Dunlop, J.-M. Kiat, G. Baldinozzi, and S.B. Vakhrushev

Macroscopic elastic and electric fields in ferroelectrics: Phenomenol-

ISRF-II PAPERS

ogy and simulations
E. Klotins, A. Stemberg, and K. Kundzins

Dynamic dielectric permittivity of !:! family relaxors
M.D. Glinchuk, V.A. Stephanovich, B. Hilczer, J. Wolak, and C. Caranoni

Peculiarities of AC-fields influence on dielectric properties of PZT-based ferroceramics
A.V. Shil'Nikov, I.V. Otsarev, A.I. Burkhanov, V.N. Nesterov, and G.M. Akbaeva

Relaxor-like behavior of thin ferroelectric films with imperfect crystal structure
E.V. Sviridov, I.N. Zakharchenko, V.A. Alyoshin, L.A. Sapozhnikov, Yu. I. Yuzyuk, R. Farhi, and V.L. Lorman

Structural peculiarities of $(PbMg_{1/3}Nb_{2/3}O_3)_{1-x}$-$(PbTiO_3)_x$ solid solutions
S.G. Zhukov, V.V. Chernyshov, and S.B. Vakhrushev

Kinetic study of PZN single crystal polarization under a static electric field
H. Dammak, A. Lebon, and G. Calvarin

Static distortion field induced by an anhormonic standing wave
Jacob Szeftel

Dielectric and electromechanical properties of ceramic solid solutions $PbMg_{1/3}Nb_{2/3}O_3$-$PbZr_{0.53}Ti_{0.47}O_3$
A.N. Tsotsorin, S.A. Gridnev, S.P. Rogova, and A.G. Luchaninov

Possible role of charge transfer vibronic excitons in light induced change of polarizability in ferroelectric solid solutions $KTA_{1-x}NB_xO_3$
V. Vikhnin, H. Liu, and W. Jia

X-ray and dielectric studies of liquid-phase sintered $PBB_{1/2}^{3+}B_{1/2}^{5+}O_3$ ceramics with differing degree of compositional ordering
I.P. Raevski, V.Yu. Shonov, M.A. Malitskaya, E.S. Gagarina, V.G. Smotrakov, and V.V. Eremkin

Jahn-Teller polarons and peculiarities of their absorption in $LaMnO_3$ and $La_{1-x}Sr_xMnO_3$ perovskite-like systems
V.S. Vikhnin, S. Kapphan, B.A.Melekh, and E.B. Shadrin

T-x-s phase diagram of compositionally orderable $(1-x)PbSc_{1/2}Nb_{1/2}O_3$-$xPbSc_{1/2}Ta_{1/2}O_3$ solid solution
I.P. Raevski, M.A. Malitskaya, E.S. Gagarina, V.G. Smotrakov, and V.V. Eremkim

Scattering by fractals
José Teixeira

On the nature of low-frequency internal friction near the ferroelastic phase transition in $Ba_2NaNb_5O_{15}$
S.A. Gridnev, A.V. Biryukov, and O.N. Ivanov

Investigation of the relaxor system $Pb_{1-x}BaySc_{1/2}Nb_{1/2}O_{3-x+y}$ by Raman scattering
C. Malibert, G. Baldinozzi. A. Bulou, and J.-M. Kiat

Dielectric, pyroelectric, and piezoelectric properties of bismuth-modified 0.69PMT-0.31PT ceramics
Heung Sung Lee, Jong Man Jung, and Seong Won Choi

Relaxor behavior of solid solutions of the system $Pb[(Mg_{0.5}W_{0.5})_{1-x}Ti_x]O_3$
V.V. Shvartsman, E.D. Politova, and S.Yu. Stefanovich

Relaxation in ferroelectric solid solutions of the system $Pb(Fe_{2/3}W_{1/3})O_3$-$PbTiO_3$ over the microwave range
Yu.A. Shevchuk, S.K. Korchagina, and V.V. Gagulin

Non-stationary and relaxation processes and induced microscale polar regions in incommensurate phase of ferroelectric semiconductor $Sn_2P_2Se_6$
S.L. Bravina, A.N. Morozovska, and N.V. Morozovsky

Photothermomodulation probing of $Pb(Mg_{1/3}Nb_{2/3)})O_3$ single crystals
S.L. Bravina, M.D. Glinchuk, and N.V. Morozovsky

ISFS-8 PAPERS

EIGHTH INTERNATIONAL SYMPOSIUM ON FERROELECTRIC SEMICONDUCTORS (ISFS-8)

The Eighth International Symposium on Ferroelectric Semiconductors was held on 30 August – 5 September 1998 in Rostov-on-Don, Russia. ***A.A. Grekov*** *and* ***S.O. Kramarov****, guest editors of the proceedings of this meeting published in* **Ferroelectrics**, *Volume 247, Numbers 1–3 (2000), explained that ISIF-8 was different from previous ISIFs because it occurred in conjunction with the International Symposium on High Temperature Superconductors, gathering 50 participants from the former Soviet Union, Italy, Japan, Israel, and other countries. The contacts between scientists from both branches of solid state physics enriched the field with new ideas and approaches.*

We quote from the editorial: "Prof. P. Marchetti proposed a modem theory of HTS state accounting for the peculiarities of chemical bonds, while Prof. B. Gadjiev presented some bold assumptions about the influence of Lifthich-like inhomogeneous interactions. Prof. Kasuo Gesi underlined the role and the nature of isostructural phase transitions. There are many other interesting reports with new hypotheses on the nature of structural phase transitions. On the other hand, the tremendous experience of the ferroelectric community in growing monocrystals and its certification is very useful for research of HTS compounds. There was great interest in the reports of Prof. L. Resnichenko on high quality ceramics molding."

To gain a better understanding of the importance of the new feature of ISIF-8, the guest editors gave an overview of the historical facts and unsolved principal questions surrounding the remarkable properties of SbSI since it was discovered in 1958. Before the discovery of this compound nobody imagined the coexistence of noticeable conductivity with ferroelectricity may be useful. Structural phase transition in a low symmetric state with broken space inversion symmetry may not suppress conductivity completely. And the reverse is true: Restricted conductivity cannot screen the polarization of the state and suppress ferroelectric domain walls motion under an applied electric field. The coexistence of these seemingly inconsistent properties of ferroelectricity and conductivity provided many opportunities for technical applications and introduced new ideas in the theory of semiconductors and ferroelectrics.

The next level of investigation concentrated on researching the improper semiconductors, i.e., ferroelectric oxides, whose conductivity relates to the defects of crystal structure and/or stoichiometry of compositions. The anomalous dependence of dielectric susceptibility and domain wall's formation versus temperature in semiconductor oxides reflects antiferroelectric ordering on a microscopic scale which in principle cannot be compensated for by the improper conductivity. This class of improper ferroelectrics/improper semiconductors is of particular interest due to their possible applications in high frequency devices. Semiconducting antiferroelectric complex oxides display unusual magnetic properties if they contain the ions of transition metals and/or lantanides. The coexistence of dielectric, magnetic and semiconducting anomalies attracted researchers from different branches of solid state physics. As a result of these multidisciplinary interactions, new classes of active materials were found, among them high temperature superconducting copper oxides and substances displaying colossal magnetoresistivity.

High temperature superconductivity (HTC) is one of the great discoveries of the last quarter of the twentieth century. Compounds displaying HTC were a logical result of multidisciplinary research of complex semiconducting oxides with transition ions. The complex lantanium copper oxide, considered a perfect crystal, displays antiferromagnetic and dielectric properties. When doped by several percent of two-valent ions like Ba and Sr, it loses magnetic order and suffers antiferrodistorsive, crumpling type transformations accompanied by the rising of hole-like type conductivity. In 1986, Bednortz and Muller discovered that semiconducting and antiferroelectric compositions when cooled below 30 K enter a superconducting state.

It was the first example of superconductors with Tc overcoming the upper level predicted by the Bardeen-Cooper-Schrieffer theory, based on the electron-phonon coupling as a main reason for the composite bosons (Cooper's pairs) formation. The superconductors with unknown nature of charge boson formation and unexpected high Tc were called

ISFS-8 PAPERS

high temperature superconductors (HTS).

Now the HTS family consists of more than 60 different compounds of different structure. The nature of their unusual high Tc superconducting state is not yet understood. What surprises scientists is that the HTS states occur in substances closely related to ferroelectrics. All known HTS crystals contain copper ions, many of which are "hard" ferroelectrics.

The structure of HTS crystals belongs to the layered perovskite family. The perovskite family contains many ferroelectrics and antiferroelectrics. It is obvious that coexistence of the homogeneous superconducting condensate state and ferroelectricity is impossible, as well as its coexistence with ferromagnetic ordering. Bulk superconductivity often coexists with ferromagnetic domains inside a specimen. The coexistence of spontaneous magnetic induction and macroscopic superconductivity results in the so-called spontaneous vortex state or in superconductivity with the negative first critical field. What is the reason for such striking differences between ferromagnets and ferroelectrics? In the simple case of isotropic pairing described by the BCS theory, this question seems to be trivial. The relaxation time of charge carriers in metallic (low temperature and isotropic) superconductors is zero. But if the pairing is nontrivial, as it is for most investigated HTS compounds, the answer is not simple at all.

For many years, researchers have tried to define the nature of couplings responsible for the ferroelectric state. They have created a variety of models, yet the nature of ferroelectricity is not clear in this sense. The same is true about the nature of HTS phenomena. Taking into account any appropriate model with phenomenological, i.e., effective, intensity of interactions and using self-consistent approximations to define thermodynamic quantities, we may explain everything. But it is the level of comprehension which characterized the phenomenological Weiss theory of ferromagnets. The main question is: What is the origin of the Weiss field? The understanding of the nature of HTS and ferroelectrics must have the same phenomenological level as the Weiss model of ferromagnets.

The following is a list of authors and titles of the papers presented at ISFS-8.

Study of optical spectra in Fe- and Co-doped barium titanate single crystals during phase transitions
T.P. Myasnikova, S.G. Gakh, and R.Ya. Evseeva

Distribution of charge carriers in a system of large radius polarons and bipolarons and delocalized carriers
A.E. Myasnikova and E.N. Myasnikov

Some peculiarities in the measurement of the main polarization curve of a ferroelectric film when there is a transition layer between film and substrate
S.V. Tolstousov

The growth and study of $PbSc_{0.5}Nb_{0.5}O_3$-$BaSc_{0.5}Nb_{0.5}O_3$ solid solution crystals
I.P. Raevski, V.G. Smotrakov, V.V. Eremkin, E.S. Gagarina, and M.A. Malitskaya

Electron emission from ferroelectric ceramics caused by unipolar switching pulses
A.N. Pavlov, I.P. Raevski, and V.P. Sakhnenko

Pyroelectric properties and domain structure of modified lead ferroniobate-based ceramics
Yu.N. Zakharov, I.P. Raevski, E.I. Eknadiosians, A.N. Pinskaya, L.E. Pustovaya, and V.Z. Borodin

Isostructural phase transition in Ba-Li niobate
E.N. Sidorenko, I.A. Gurnikovski, and A.V. Turik

The relation between the dielectric dispersion and distribution of ions and vacancies in the unit cell of oxides of the $K_{2-x}Pb_4Li_xNb_{10}O_{30}$ composition
V.G. Kryshtop, E.N. Sidorenko, and A.V. Turik

The phases of tetragonal tungsten bronze in the ternary oxide system $Ba_2Li_2Nb_{10}O_{30}$ - $Pb_2Li_2Nb_{10}O_{30}$ - $Sr_2Li_2Nb_{10}O_{30}$
Olga A. Bunina, Igor A. Gurnikovski, and Ludmila M. Rudkovskaya

The synthesis mechanism of com-

ISFS-8 PAPERS

plex oxide films formed in dense RF-plasma by reactive sputtering of stoichiometric targets
V.M. Mukhortov, Y.I. Golovko, G.N. Tolmachev, and A.N. Klevtzov

The governing of anisotropy of real piezoelectric ceramic materials
D.I. Makariev, V.G. Gavrilyatchenko, A.N. Klevtsov, and L.A. Reznitchenko

The influence of phase hardening on the diffusion of ferroelectric transitions in the (1-x)$NaNbO_{3-x}LiNbO_3$ system
L.V. Pozdnyakova, L.A. Reznitchenko, and V.G. Glavrilyatchenko

Secondary discontinuous recrystallization as a manifestation of the effect of self-organization in niobate ferroelectric ceramics
L.A. Reznitchenko, V.A. Alyoshin, A.N. Klevtsov, O.N. Razumovskaya, and L.A. Shilkina

On the possibility of isomorphic substitutions in ferroelectrics with the perovskite- and pseudoilmenite-type structure
N.V. Dergunova, L.A. Reznitchenko, V.P. Sakhnenko, O.N. Razumovskaya, and G.A. Geguzina

Phase diagrams and ferroelectric properties of solid solutions of the ternary systems (Na, $Li,Cd_{0.5})NbO_3$ and $(Na,Li,Sr_{0.5})NbO_3$
L.A. Raznitchenko, O.N. Razumovskaya, L.A. Shilkina, A.Ya. Dantsiger, S.I. Dudkina, I.V. Pozdnyakova, and V.A. Servuli

Physical properties of the magneto-superconducting $R_{2-x}Ce_xRuSr_2Cu_2O_{10-\partial}$ compounds
I. Felner

Orbit spaces: A tool to analyze phase transitions
Vittorino Talamini

Hall-effect study of $YbNi_2B_2C$ borocarbide
V.N. Narozhnyi, V.N. Kochetkov, A.V. Tsvyashchenko, and L.N. Fomicheva

U(1) x Su (2) gauge theory of underdoped high T_c cuprates via Chern-Simons bosonization
P.A. Marchetti

Model of molding of piezoceramics under pressure
Yu.V. Prus, E.N. Klimova, Yu.M. Gufan, S.O. Kramarov, L.M. Katsnelson, and M.I. Kovalenko

Effective conductivity of DTGS and TGS single crystals under ultraweak fields of low and ultralow frequencies
A.V. Shil'Nikov, L.A. Shuvalov, A.P. Pozdnyakov, and V.A. Fedorikhin

Dielectric properties of PZT-based compositions on the morphotropic phase boundary
A.V. Shil'Nikov, I.V. Otsarev, A.I. Burkhanov, V.N. Nesterov, and G.M. Akbaeva

Theory of phase diagram of ferroelectrics with isostructural phase transformation
K. Gesi, Yu.V. Prus, E.S. Larin, and K.D. Romanovskii

Dynamics of dissipation processing during nonelastic deformation of quasi-brittle materials
Yu.V. Prus

Symmetry induced ferroelastic isostructural phase transition and sound propagation anomaly in potassium rich feldspars
Yu.M. Gufan, E.S. Larin, M.I. Novgorodova, Yu.V. Prus, and A.N. Sadkov

NEW MRS PUBLICATIONS

Ultrathin SiO_2 and High-K Materials for ULSI Gate Dielectrics

Topics in this volume include: Advances in ultrathin oxides and oxynitrides, silicon nitride; silicon oxynitrides and nitrides – alternative processes for growing SiO_2; atomic-scale control of the dielectric/silicon interface; electrical properties of ultrathin gate dielectrics; reliability of ultrathin gate dielectrics; high-k gate dielectrics; high-k gate dielectrics – alternative processes; characterization of gate dielectrics; and integrated processing.
Editors: H.R. Huff, C.A. Richter, M.L. Green, G. Lucovsky, and T. Hattori.
Volume 567 in the MRS Symposium Proceedings Series, ISBN: 1-55899-474-2.

BIOFERROELECTRICITY

FERROELECTRIC AND RELATED MODELS IN BIOLOGICAL SYSTEMS

In a special issue (Volume 220, Numbers 3-4 (1999), ***Ferroelectric and Related Models in Biological Systems****,* **Ferroelectrics** *published a collection of papers from the* ***Second Workshop on Nonlinear Models of Biomembrane Molecular Structures****, held in Pushchino, Russia, on 26 June – 1 July 1995, and the* ***Workshop on Condensed-State Models of Voltage-Dependent Ion Channels****, held in Kansas City, Missouri, USA, on 25 February 1998 as part of the 42nd Annual Meeting of the Biophysical Society.*

Guest editors ***H. Richard Leuchtag*** *and* ***Vladimir S. Bystrov*** *write in their editorial: "The goal of this special issue of* Ferroelectrics *is to explore whether certain macromolecular structures of biology can be described as ferroelectric, and whether such a description might help us understand some of the functional processes of living organisms. To accomplish this goal could mean closing a major gap in our understanding, possibly leading to advances in medicine and technology. This gap exists in part because of traditional differences in style, language and methods between physical scientists and biological scientists. However, these differences need not deter us from making progress. The name given to this new branch of science is* bioferroelectricity*."*

The papers featured in this special issue focus on two distinct types of biological structures suspected of displaying ferroelectric properties. One type is the microtubules *ubiquitously distributed in cells, where they help define the shape of the cell, move it about, and function in transporting materials within the cell, including the dance-like movement of chromosomes in cell division. The other type is the* voltage-dependent ion channels *found widely in cell membranes and associated with impulse conduction in nerve and muscle cells. Both types of structures are proteins and are involved with information processing at the cell level.*

The areas of bioferroelectricity covered in the papers are:

1. Recent work showing that microtubules, fibrous structures that constitute part of the cytoskeleton of protist, plant, and animal cells, exhibit ferroelectric properties.

2. A review of the evidence for the hypothesis that excitability in nerve and muscle membranes is based on the ferroelectric properties of certain membrane molecules, the voltage-dependent ion channels. These molecules are capable of switching between nonconducting and ion-conducting states, the latter states being highly ion-selective. This nonlinear behavior is here ascribed to a phase transition in the ion channel, viewed as a ferroelectric liquid crystal component.

3. Examination of the internal motions of oligopeptides within the framework of nonlinear dynamics.

4. Use of infrared techniques to study the polarizability and transfer of protons in the hydrogen bonds important in biological structures and suggestion of an analogous bonding mechanism with metal ions substituting for protons.

5. Use of nuclear magnetic resonance to study transitions between ferroelectric and superionically conducting states in a crystal and a protein.

6. Examination of a model of voltage-dependent gating based on proton mobility in a water pore with fixed charges.

7. Combination of the concept of a ferroelectric-superionic transition in a membrane with that of self-organization in a dissipative chemical system.

8. A ferroelectric model to explain the conduction of an impulse and its stimulation by a magnetic field.

9. Review of a large body of evidence for phase transitions in nerve fibers, cells, and synapses.

BIOFERROELECTRICITY

10. Influence of of microwave irradiation on the kinetics of calcium-activated potassium channels.

11. Insertion of peptides mimicking functional parts of ion channels into membranes to investigate correlations between conformation and function.

A review of the ferroelectric model of microtubules
J.A. Brown and J.A. Tuszynski

Theoretical models of conformational transitions and ion conduction in voltage-dependent ion channels: Bioferroelectricity and superionic conduction
H. Richard Leuchtag and Vladimir S. Bystrov

Nonlinear dynamics of molecular systems and the correlations of internal motions in oligopeptides
Konstantin V. Shaitan, Maria D. Ermolaeva, and Sergei Saraikin

IR and FTIR studies of proton polarizability and proton transfer with hydrogen bonds and hydrogen-bonded systems: Importance of these effects for mechanisms in biology
Georg Zundel

Ferroelectric superionically conducting phase transition via NMR
G.I. Ovtchinnikova, A.V. Kutyshenko, and N.D. Gavrilova

A model for ion channel voltage gating with static S4 segments
Jianjun Lu, Jian Yin, and Michael E. Green

Self-organized chemical model and approaches to membrane excitation
Takayuki Tokimoto, Kotaro Shirane, and Hiroyuki Kushibe

A ferroelectric model for the generation and propagation of an action potential and its magnetic field stimulation
Alex Gordon, B.E. Vugmeister, H. Rabitz, Simon Dorfman, Joshua Felsteiner, and Peter Wyder

Evidence for phasse transition in nerve fibers, cells, and synapses
I. Tasaki

Influence of microwave irradiation on kinetic parameters of single Ca^{2+}-activated K^{+} channels
V.N. Kazachenko, E.E. Fesenko, K.V. Kochetkov, and N.K. Chemeris

Functional, structural, and molecular dynamics correlates of voltage sensors: Implications for gating mechanisms
O. Helluin, P. Cosette, P.C. Biggin, M.S.P. Sansom, and H. Duclohier

FWPR-99 PAPERS

FERROELECTRICS WORKSHOP IN PUERTO RICO (FWPR-99)

The Ferroelectric Workshop in Puerto Rico, held on 12 – 14 May 1999 in Guánica, Puerto Rico, was organized with the purpose of providing a forum for the exchange of scientific ideas and technological advances in the areas of processing and applications of ferroelectric materials.

The proceedings of the Ferroelectric Workshop in Puerto Rico are published in **Integrated Ferroelectrics**, *Volume 28, Numbers 1-4 (2000) and Volume 29, Numbers 1-2 (2000). Guest editors are* ***F.A. Miranda, R.S. Katiyar,*** *and* ***F.R. Fernández****.*

A round table discussion on the future trends in ferroelectric research and technology with panelists O. Auciello, F. Van Keuls, A. Bhalla, S.B. Desu, J. Horwitz, D.A. Payne, and R. Ramesh focused on the future of ferroelectric and dielectric thin film based technologies. The panelists, with active participation of the audience, concluded that there are immense opportunities in this field for research, development, and productization. At the same time there was concern about the sustainability of research and development activities, especially in the United States, given the sparse funding available in this area. The main topics of discussion were memories, microwave components, and markets.

The following is a list of authors and titles of the FWPR-99 presentations.

Studies of ferroelectric heterostructure thin films and interfaces via *in situ* analytical techniques
Orlando Auciello, Alan R. Krauss, Jaemo Im, Anil Dhote, Dieter M. Gruen, Eugene A. Irene, Ying Gao, Alex H. Mueller, and Ramamoorthy Ramesh

MAPLE direct write: A new approach to fabricate ferroelectric thin film devices in air at room temperature
J.M. Fitz-Gerald, H.D. Wu, A. Pique, J.S. Horwitz, R.C.Y. Auyeung, W. Chang, W.J. Kim, and D.B. Chrisey

Solution synthesis of epitaxial films of bismuth containing ferroelectric materials
David B. Beach, Jonathan Morrell, Ziling B. Xue, and Eliot D. Specht

Potential impact of ferroelectric technology for PCS and cellular communications
Stanley S. Toncich

Thin film $Ba_xSr_{1-x}TiO_3$ Ku- and K-band phase shifters grown on MgO substrates
F.W. Van Keuls, C.H. Mueller, F.A. Miranda, R.R. Romanofsky, J.S. Horwitz, W. Chang, and W.J. Kim

High quality $Ba_xSr_{1-x}TiO_3$ films grown by MOCLD and novel ferroelectric/ferrite structures for dual-tuning microwave devices
H. Jiang, W. Hu, S. Liang, V. Fouflyguine, J. Zhao, Q.X. Jia, J.R. Groves, P. Arendt, F. Miranda, A. Drehman, S. Wang, and P. Yip

Effect of DC biasing on YBCO/STO/LAO tunable microstrip filters
Guru Subramanyam, Fred W. Van Keuls, and Felix A. Miranda

Brillouin and Raman spectra anomalies in KNSBN with the tungsten bronze structure
I.G. Siny, S.G. Lushnikov, S.I. Siny, V.H. Schmidt, A.A. Savvinov, and R.S. Katiyar

Preferentially oriented $(La,Sr)CoO_3$/$PbLa_{0.1}TiO_3$/$(La,Sr)CoO_3$ tri-layers on lithium-fluoride and sodium-chloride substrates
Judy Wu, S.C. Tidrow, M.Z. Tidrow, M.H. Ervin, Robert C. Hoffman, C. Wesley Tipton, Dale N. Robertson, and William W. Clark, III

Improvements in the figure of merit for tunable microwave dielectrics using combinatorial approach
Hauyee Chang and Xiao-Dong Xiang

Ferroelectric lens phased array antenna: An update
Jaganmohan B.L. Rao and Dharmesh P. Patel

Characterization of $(Ba_{0.5}Sr_{0.5})Ti_1O_3$ thin films for Ku-band phase shifters

FWPR-99 PAPERS

Carl H. Mueller, Fredrick W. Van Keuls, Robert R. Romanofsky, Felix A. Miranda, Joseph D. Warner, Chadwick L. Canedy, and Ramamoorthy Ramesh

Evaluating voltage-tunable materials for RF phase shifter technology
S.C. Tidrow, E. Adler, T. Anthony, W. Wiebach, and J.Synowczynski

Deposition and characterization of low-loss epitaxial nonlinear dielectric thin films for microwave devices
Allen M. Hermann, Badri Veeraraghavan, Davor Balzar, and Fred R. Fickett

Supression of size effects in ferroelectric films
Seshu B. Desu and Orest G. Vendik

Electrodynamic properties of single-crystal and thin-film strontium titanate
A.T. Findikoglu, Q.X. Jia, D.W. Reagor, C. Kwon, and K.O. Rasmussen

Process control and pulsed laser deposition of materials
R. Biggers, G. Kozlowski, J. Jones, D. Dempsey, R. Kleismit, I. Maartense, J. Busbee, T. Peterson, and R. Perrin

High density ferroelectric memories: Materials, processing, and scaling
S. Aggarwal, C. Ganpule, I.G. Jenkins, B. Nagaraj, A. Stanishevsky, J. Melngailis, E. Williams, and R. Ramesh

GHZ polarization dynamics in ferroelectric thin films
Charles Hubert, Jeremy Levy, Ed Cukauskas, and Stephen W. Kirchoefer

Epitaxial behavior and interface structures of BSTO thin films
C.L. Chen, Z. Zhang, H. Feng, G.P. Luo, S.Y. Chen, A. Heilman, W.K. Chu, C.W. Chu, J. Gao, B. Rafferty, S.J. Pennycook, Y. Liou,F.A. Miranda, and F. Van Keuls

Dielectric and lattice dynamical properties of $SrTiO_3$ thin films
X.X. Xi, A. Sirenko, I.A. Akimov, A.M. Clark, J.H. Hao, and Weidong Si

NEW MRS PUBLICATIONS

In situ Process Diagnostics and Modelling

Topics in this volume include: *In situ* ion- and electron-beam analysis; *in situ* spectroscopic ellipsometry and other optical characterization; *in situ* diagnostics and modelling; *in situ* X-ray, TEM, STM/AFM characterization and processing control; and *in situ* emisssion and optical characterization techniques.
Editors: Orlando Auciello, Alan R. Krauss, Eugene A. Irene, and J. Albert Schultz.
Volume 569 in the MRS Symposium Proceedings Series, ISBN: 1-55899-476-9; 27 papers, 199 pages.

Si Front-End Processing: Physics and Technology of Dopant-Defect Interactions

Topics in this volume include: Ultrashallow junctions; mechanisms of point-defect interaction and diffusion; modelling; transient-enhanced diffusion (TED); surface and interface effects; 2-D profiling; and SiGe and nitrogen.
Editors: Hans-Joachim L. Gossman, Tony E. Haynes, Mark E. Law, Arne Nylandsted Larsen, and Shinji Odanaka.
Volume 568 in the MRS Symposium Proceedings Series, ISBN: 1-55899-475-0; 42 papers, 298 pages.

Low-Dielectric Constant Materials

Topics in this volume include: Porous films – organic and inorganic; porous films – organic/low-k integration; low-k integration; low-k/advanced interconnect; low-dielectric constant materials and applications in microelectronics; and low-k film property/integration.
Editors: John Hummel, Kazuhiko Endo, Wei William Lee, Michael Mills, and Shi-Qing Wang.
Volume 565 in the MRS Symposium Proceedings Series, ISBN: 1-55899-472-06.

Contact

Materials Research Society, Customer Services Department
phone: +724-779-3003; fax: +724-779-8313; email: info@mrs.org; www.mrs.org

PUBLICATIONS

HANDBOOK OF THIN FILM MATERIALS
Processing, Characterization and Properties
5-Volume Set
Edited by
Hari Singh Nalwa

This five-volume handbook focuses on processing techniques, characterization methods, and physical properties of thin films – thin layers of insulating, conducting, or semiconducting materials. The Handbook includes information on:

- Thin films of metals
- Semimetals
- Glasses
- Ceramics
- Alloys
- Organics
- Diamonds
- Graphites
- Porous materials
- Noncrystalline solids
- Supramolecules
- Polymers
- Copolymers
- Biopolymers
- Composites
- Blends
- Activated carbons
- Intermetallics
- Chalcogenides
- Dyes
- Pigments
- Nanostructured materials
- Biomaterials
- Inorganic/polymer composites
- Organoceramics
- Metallocenes
- Disordered systems
- Liquid crystals
- Quasicrystals
- Layered structures

Thin films is a research area of the utmost importance in today's materials science, electrical engineering, and applied solid state physics fields with applications in microelectronics, computer manufacturing, and physical devices.

The *Handbook of Thin Film Materials* is a omprehensive reference focusing on processing techniques, characterization methods, and physical properties of these thin film materials. The volume titles are:

Volume 1: Deposition and Processing
Volume 2: Characterization and Spectroscopy
Volume 3: Ferroelectric and Dielectric Thin Films
Volume 4: Semiconductor and Superconducting Thin Films
Volume 5: Magnetic Thin Films

Available in October 2001 at Academic Press:
phone: +800-321-5068; in Europe call +44-208-308-5700; fax: +800-874-6418; email: ap@acad.com

www.academicpress.com

PUBLICATIONS

HANDBOOK OF SURFACES AND INTERFACES OF MATERIALS
5-Volume Set
Edited by
Hari Singh Nalwa

The *Handbook of Surfaces and Interfaces of Materials* brings together all aspects of the chemistry, physics, and engineering of surfaces and interfaces of materials currently studied in academic and industrial research. It covers different experimental and theoretical aspects of surfaces and interfaces, their physical properties, and the spectroscopic techniques that have been applied to a wide class of inorganic, organic, polymer, and biological materials.

With the explosion of scientific information on surfaces and interfaces of materials and their spectroscopic characterization, the large volumes of experimental data on the chemistry, physics, and engineering aspects of materials surfaces and interfaces remain scattered in many different periodicals. This handbook will provide a comprehensive compilation of this research data reflecting the diversified technological applications of surface science.

The information presented in this reference draws on two decades of pioneering research on the surfaces and interfaces of materials to offer a complete perspective on the topic. Fully cross-referenced, this book has wide appeal as an essential reference source with contributions from internationally recognized experts from all over the world.

Key Features

- Most up-to-date reference work summarizing two decades of pioneering research in surfaces and interfaces
- 62 state-of-the-art review chapters written by 120 experts from 23 countries
- More than 15,000 bibliographic citaions and several thousand illustrations, figures, tables, and equations
- Multidisciplinary reference source for scientists, researchers, and students working in surface science, semicon ductor technology, solid state physics, materials science, biology, chemistry, electrochemistry, colloidal science, polymer science, tribology, nanoscale science and technology, electrical engineering, chemical and mechanical engineering, and computer engineering

This handbook is aimed at scientists, researchers, and upper level graduate students working to understand interface phenomena in surface science, semiconductor technology, solid state physica, materials science, biology, chemistry, electrochemistry, colloidal science, polymer science, tribology, nanoscale science and technology, electrical engineering, microelectronics, chemical and mechanical engineering, and computer engineering, as well as for the technocrats who are involved in the surface science and engineering of materials and devices.

Volume 1: Surface and Interface Phenomena
Volume 2: Surface Characterization and Properties
Volume 3: Nanostructures, Micelles, and Colloids
Volume 4: Thin Films and Layers
Volume 5: Biointerfaces and Applications

Available in August 2001 at Academic Press:
phone: +800-321-5068; in Europe call +44-208-308-5700; fax: +800-874-6418; email: ap@acad.com
www.academicpress.com

NEW JOURNAL

CRYSTAL GROWTH & DESIGN

Last October the American Chemical Society announced the publication of a new journal, *Crystal Growth & Design*, that is being created to stimulate and share knowledge among scientists and engineers working in the fields of crystal growth, crystal engineering, and the industrial application of crystalline materials. In the words of its editor, Robin D. Rogers, this new journal is "a forum where chemists, physicists, biologists, and engineers can interact and share their expertise on the design and growth of crystalline materials as well as their industrial applications."

Scientists are invited to submit:

- Communications – Preliminary reports of original, significant research results
- Articles – Comprehensive reports of original, significant research results
- Reviews – Critical evaluations of the existing state of knowledge on a particular facet of the science or technology within the journal's scope
- Perspectives – Either a personal view or philosophical look at a topic within the journal's scope

The journal will accept contributions from these diverse areas:

- Crystal engineering (e.g., organic, inorganic, and hybrid solids)
- Crystal growth of inorganic, organic, and biological substances (e.g., biomineralization)
- Polymorphism, polytypism
- Development of new nanostructural phases
- Intermolecular interactions in the solid state (e.g., hydrogen bonding, lattice energies)
- Modeling of crystal growth processes
- Prediction of crystal structure and crystal habit
- Determination and calculation of electronic distribution in the solid state
- Nucleation theory
- Molecular kinetics and transport phenomena in crystal growth
- Phase transitions
- Solvation and crystallization phenomena, modeling of crystallization processes
- Purification techniques, industrial crystallization

Crystal Growth & Design will not cover routine reports of crystal or molecular structures.

The *Crystal Growth & Design* manuscript submission process offers authors the flexibility of submitting manuscripts for consideration (and final accepted manuscripts for publication) via a secure website at **http://pubs.acs.org/crystal**. Authors will find a complete overview of the manuscript submission process here (click on " Info for Authors") as well as a "Frequently Asked Questions" page and other helpful guidelines to assist authors.

There are two options in submitting manuscripts electronically:

- Submitting the manuscript in PDF format
- Having the publisher convert it from a word processing document into PDF format.

Electronic submission is highly recommended as it speeds up the manuscript review process. More than 80 peercent of authors published in *Organic Letters* have used it and found it an excellent way of assuring a fast, accurate, and convenient publishing procedure.

UPCOMING MEETINGS

Second Ferroelectric Workshop in Puerto Rico (FWPR'01)
1 – 2 June 2001
San Juan, Puerto Rico

The purpose of FWPR'01 is to provide a forum for the exchange of scientific ideas and recent technological advances in the areas of nanoscience, processing, and applications of ferroelectric materials. Participation in the workshop is limited to about 30 speakers, mainly from the continental United States and Puerto Rico, and about 40 others, including students. This makes it large enough for two full days of presentations but still small enough to promote effective interactions among attendees. The workshop will have a panel discussion at the end of the second day about the future trends in ferroelectrics.

The conference is open to scientists, engineers, and students interested in the area of ferroelectric materials and their applications. The conference program will consist of oral presentations and a poster session with particular emphasis on the topics listed below. The pressentations will be arranged in single sessions, while allowing for reasonable amount of time for discussions. The poster session is scheduled at the end of the first day of the meeting. The poster presentations will be evaluated for the best three awards. The conference presentations will be published in *Integrated Ferroelectrics.*

Topics

- Materials processing and integration
- Thin film growth and substrates
- Ferroelectric relaxors
- Nanoscience and technology, nanophase and meta materials
- Tunable high dielectric materials for high frequency applications
- Microelectromechanical systems (MEMS)
- Sensors, transducers, and nonlinear optical devices
- Ferroelectric memories

Sponsors

- Defense Advanced Research Projects Agency (DARPA)
- National Aeronautics and Space Administration (NASA)
- University of Puerto Rico, Faculty of Natural Sciences, Río Piedras Campus
- Puerto Rico Experimental Program to Stimulate Competitive Research (PR-EPSCoR)
- Gordon and Breach Scientific Publishers

Organizing Committe

- Ram S. Katiyar (UPR-RP) - General Chair
  Physics Department, University of Puerto Rico
  PO Box 23343, San Juan, PR 00931-3343 USA
  phone: +787-751-4210; fax: +787-764-2571; email: rkatiyar@upracd.upr.clu.edu

- Félix Fernández (UPR-MG)
  Physics Department, University of Puerto Rico
  PO Box 9016, Mayagüez, PR 00981-9016 USA
  phone: +787-265-3844; fax: +787-832-1135; email: f_fernández@rumac.upr.clu.edu

UPCOMING MEETINGS

2001 MRS Fall Meeting
26 – 30 November 2001
Boston, Massachusetts, USA

The 2001 MRS Fall Meeting will be held on 26-30 November 2001 at the Hynes Convention Center and Sheraton Boston Hotel. It will include 36 technical symposia that highlight new advances in the understanding, synthesis, and application of materials spanning inorganic electronic materials, thin films, materials science, processing evaluation, nanoscale materials, and organic/biological materials.

Scheduled Symposia

Thin Films and Surfaces

- L: Thin films – Stresses and mechanical properties IX
- M: Surface science and thin-film growth in electrolytes
- N: Current issues in heteroepitaxial growth – Stress relaxation and self-assembly
- O: Complex oxide heteroepitaxy
- P: Advances in surface engineering – Fundamentals and applications

Nanoscale Materials and Processes

- V: Nanophase and nanocomposite materials IV
- W: Nanoparticulate materials
- Y: Nanopatterning – From ultralarge-scale integration to biotechnology
- Z: Making functional materials with nanotubes
- AA: Self-assembly processes in materials

Organic/Biological Materials and Devices

- BB: Organic optoelectronic materials, processing, and devices
- CC: Advances in liquid crystalline materials and technologies
- DD: Polymer interfaces and thin films
- EE: Electroactive polymers and their applications as actuators, sensors, and artificial muscles
- FF: Physical characterization of biological materials and systems
- GG: Polymeric biomaterials for tissue engineering
- HH: Bio-inspired materials – Moving towards complexity

Meeting Chairs

- Bruce M. Clemens, Stanford University, clemens@soe.stanford.edu
- Jerrold A. Floro, Sandia National Laboratories, jafloro@sandia.gov
- Julia A. Kornfield, California Institute of Technology, jak@cheme.caltech.edu
- Yuri Suzuki, Cornell University, suzuki@ccmr.cornell.edu

Registration

Register via MRS website, email, fax, phone, or mail by 9 November 2001 to take advantage of the preregistration rates.

A meeting registration form will be posted on the website late September 2001. Registration by phone will be available beginning late September. Requests may also be emailed to **info@mrs.com**

On-site registration will begin Sunday, 25 November, in the Hynes Convention Center only.

www.mrs.org/meetings/fall2001

CALENDAR OF EVENTS 2001

Jun 1-2	•	2nd Ferroelectric Workshop in Puerto Rico (FWPR'01), San Juan, Puerto Rico (see p.14)
Aug 5-11	•	8th International Conference on Ferroelectric Liquid Crystals (FLC 2001), Washington, D.C., USA (see *Ferroelectricity Newsletter,* Vol. 8, No. 3, p. 34)
Aug 12-16	•	13th American Conference on Crystal Growth and Epitaxy, Burlington, Vermont, USA (see *Ferroelectricity Newsletter,* Vol. 9, No. 1, p. 26)
Sep 3-7	•	10th International Meeting on Ferroelectricity (IMF-10), Madrid, Spain (see Ferroelectricity Newsletter, Vol. 8, No. 3, p. 35)
Nov 26-30	•	2001 MRS Fall Meeting, Boston, Massachusetts, USA (see p.15)
Dec 3-6	•	"Advanced Materials for Noveel Microwave Deviceds" at the 2001 Asia-Pacific Microwave Conference (APMC 2001), Taipei, Taiwan (see Ferroelectricity Newsletter, Vol. 9, No. 1, p. 27)
2002		
May 28-Jun 1	•	International Joint Conference on the Applications of Ferroelectrics 2002 (IFFF 2002), Nara, Japan International Symposium on the Applications of Ferroelectrics (ISAF XIII 2002) International Symposium on Integrated Ferroelectrics (ISIF XIV 2002) The meeting on Ferroelectric Materials and their Applications (FMA XIX 2002) Contact: Prof. Tadashi Shiosaki fma@ms.aist-nara.ac.jp; website: fma.aist-nara.ac.jp

SPACE SYSTEMS ACADEMIC GROUP
CODE SP
NAVAL POSTGRADUATE SCHOOL
MONTEREY, CA 93943 USA